FLOOD INSURANCE STUDY

HAWKINS COUNTY, TENNESSEE

UNINCORPORATED AREAS

MARCH 18, 1991

Federal Emergency Management Agency

COMMUNITY NUMBER - 470085

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

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FLOOD INSURANCE STUDY

HAWKINS COUNTY,
UNINCORPORATED AREAS,
TENNESSEE

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Unincorporated Areas of Hawkins County, Tennessee, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the State (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were performed by the Tennessee Valley Authority (TVA) (the Study Contractor) for the Federal Emergency Management Agency (FEMA), under Inter-Agency Agreement No. EMW-87-E-2513, Project Order No. 1. This study was completed in February 1988.

1.3 Coordination

Streams requiring detailed study were identified at a meeting attended by representatives of the community, Study Contractor, and FEMA in August 1986.

On April 26, 1990, the results of this Flood Insurance Study were reviewed and accepted at a final coordination meeting attended by representatives of the Study Contractor, FEMA, and the community.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the unincorporated areas of Hawkins County, Tennessee. The area of study is shown on the Vicinity Map (Figure 1). The incorporated areas within the county were excluded from this study.

Flooding caused by overflow of the Holston River, Cherokee Lake, the North Fork Holston River and Crockett Creek was studied in detail.

Areas having low development potential or minimal flood hazards were previously studied using approximate analyses. The results were shown on the Flood Hazard Boundary Map for Hawkins County, Tennessee (Reference 1) and are incorporated into this Flood Insurance Study.

The areas studied were selected with priority given to all known flood hazard areas and areas of projected development or proposed construction through February 1993. The scope and methods of study were proposed to and agreed upon by FEMA and Hawkins County.

2.2 Community Description

Hawkins County is in northeast Tennessee, about 60 miles northeast of the City of Knoxville, Tennessee. It is bordered on the north by Hancock and Scott Counties, Virginia; on the east by Sullivan County, Tennessee; on the south by Greene and Hamblen Counties, Tennessee; and on the west by Grainger County, Tennessee. It is served by U.S. Route 11 and State Routes 1, 31, 34, 66, and 70. It is also served by Norfolk Southern Railway. The total area of the county is 486 square miles. The 1980 population was reported to be 43,751 (Reference 2).

Hawkins County has a warm continental climate with moderate summers. The highest monthly average summer temperature is 75 degrees Fahrenheit (^{o}F); the lowest monthly average winter temperature is 36^{o}F. The average annual precipitation of 46.5 inches is reasonably well distributed throughout the year but noticeably less in the late summer and early fall (Reference 3).

2.3 Principal Flood Problems

Information on the Holston River floods, which have occurred since the current level of regulation was achieved in 1952, is available from Cherokee Dam headwater elevation records (References 4, 5), stage records from the TVA stream gage at Rogersville (Reference 5), and records from U.S. Geological

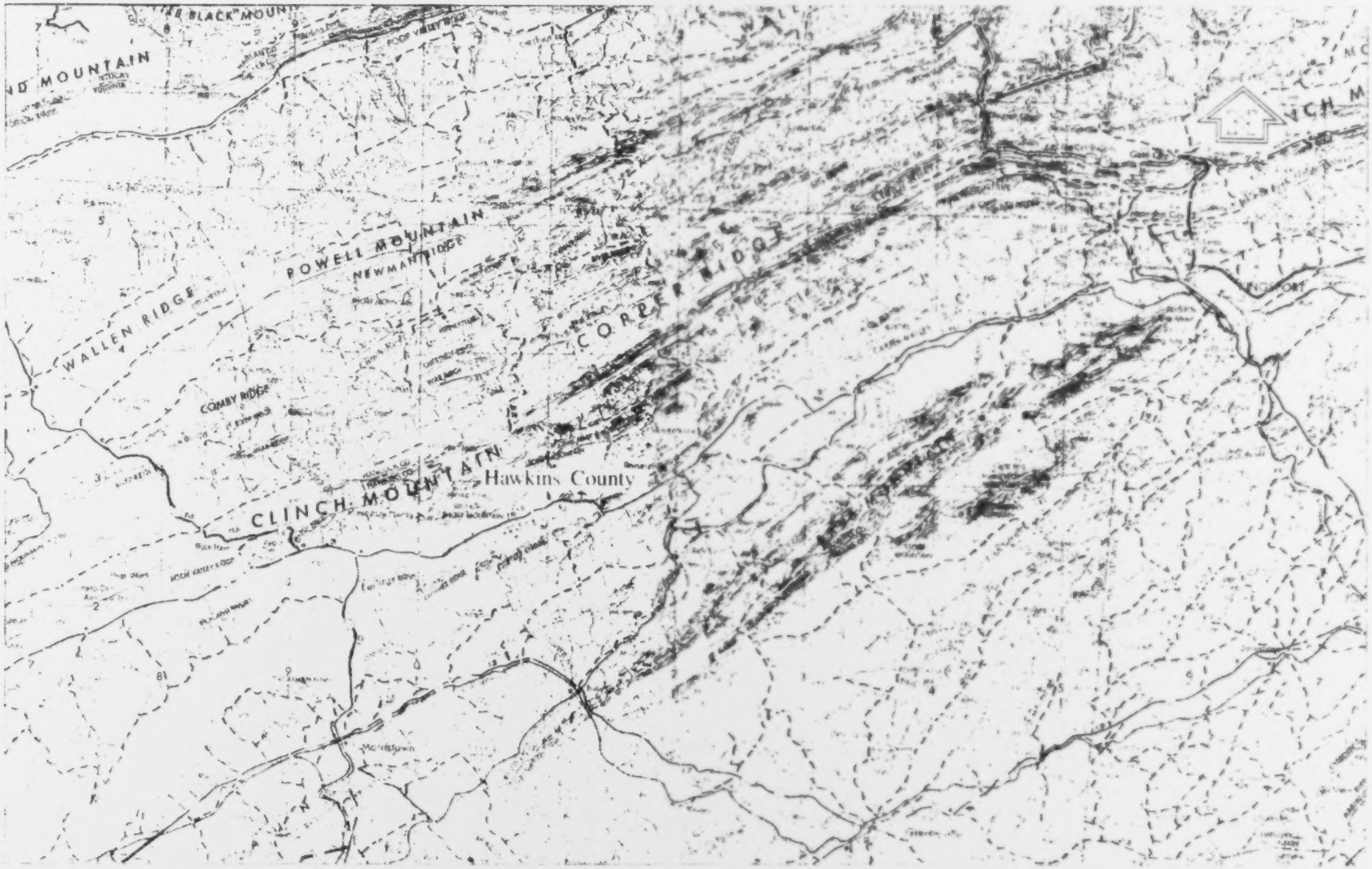

FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWKINS COUNTY, TN
(UNINCORPORATED AREAS)

APPROXIMATE SCALE

0 7 14 21 MILES

VICINITY MAP

3

Survey (USGS) stream gage No. 03490500 at Surgoinsville (References 6, 7).

In the study segment near the confluence of Crockett Creek the highest floods since 1952 resulted from Cherokee Reservoir pool levels on the following dates: May 30, 1973, elevation 1074.5 National Geodetic Vertical Datum of 1929 (NGVD); and May 13, 1984 elevation 1074.2 NGVD. Estimated recurrence intervals are about 35 years and 20 years respectively.

Flood levels in the Church Hill area (not affected by Cherokee Reservoir) reached maximum flood levels on March 13, 1963 (59,300 cfs; estimated recurrence interval of 35 years), May 8, 1984 (56,900 cfs, 20 years), and on April 5, 1977 (53,500 cfs; 15 years), based on stream gage records at Surgoinsville (Reference 6). Flood peak discharges at that gage are essentially the same as in the study area.

The maximum known flood on the Holston River at Surgoinsville was in March 1867 with an estimated discharge of 150,000 cubic feet per second (cfs). Upstream dams completed by 1952 would have reduced this flood to an estimated discharge of 105,000 cfs and a recurrence interval of about 400 years (Reference 8).

The two largest floods since 1862 on the North Fork Holston River occurred in February 1862 and March 1867 (Reference 9). The largest floods since stream gage records began in 1931 at USGS gage No. 03490000 located in Scott County, Virginia, 3.8 miles upstream, occurred in 1977, 1963, 1957, 1975, and 1972 (Reference 7 and 10). Information on these floods is listed below.

Flood Date	Discharge (cfs)	Estimated Recurrence Interval (Years)
February 1862	51,000 (estimated)	170
March 1867	47,000	100
April 5, 1977	41,000	60
March 12, 1963	30,000	17
January 30, 1957	28,700	14
March 30, 1975	28,100	13
December 11, 1972	27,400	12

Information about past flooding on Crockett Creek is available from a series of floodmarks from March 30, 1975 and August 17, 1977 floods, one floodmark from the May 7, 1984 flood, and a series of floodmarks from a within-banks flood of unknown date (Reference 5).

The largest of these floods, on August 17, 1977, reached elevation 1193.1 NGVD upstream of Cresswood Drive with an estimated recurrence interval of about 50 years. The flood was

caused by about 5 inches of rain in 9 to 10 hours based on measurements at a local radio station in the headwaters of the watershed. A local newspaper described the flooding as the worst in 40 years (Reference 11). The minor floods of May 7, 1984 and March 30, 1975 had recurrence intervals of less than 10 years.

2.4 Flood Protection Measures

Flooding in Hawkins County from the Holston River has been reduced by construction of the Cherokee Dam in 1941 and three TVA dams upstream: Watauga Dam (1948), South Holston Dam (1950), and Boone Dam (1952). Two other upstream dams, Fort Patrick Henry and Wilbur, have no reserved flood detention capacity and provide no significant regulation of floods.

Nonstructural measures of flood protection in the form of land-use regulations, which control building within areas that have a high risk of flooding (Reference 12) are being used to aid in the prevention of future flood damage.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that is expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 100-year flood (1-percent chance of annual exceedence) in any 50-year period is approximately 40-percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60-percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each riverine flooding source studied in detail affecting the community.

The principal sources of data for determining the Holston River discharge frequency were records from four USGS stream gaging

stations on the Holston River (Nos. 03490500, 03491500, 03494000, 03495500), one (No. 03490000) near the mouth of the North Fork Holston River, and one (No. 03487500) near the mouth of the South Fork Holston River (References 6, 7, 10). Data from the Surgoinsville gage was used to compute discharge-frequency. The other gage data were used to transfer Surgoinsville discharge frequency to the upstream and downstream study reaches.

A discharge-frequency curve at Surgoinsville was computed from streamflow records from 1953-1986 which are representative of the existing level of the Holston River regulation and the estimated regulated discharge of the historic March 1867 flood. The frequency analysis was made using procedures described in Bulletin No. 17B (Reference 13). Although Bulletin No. 17B procedures are not necessarily applicable to streams with upstream regulation, the resulting frequency curve fit the data well and provide a reasonable extrapolation to the TVA maximum probable flood, an extreme flood computed from transposed maximum observed storm rainfall.

Discharge-frequency adopted for the Holston River segments studied in detail was the same as that computed for the Surgoinsville gage. This was supported by analysis of available stream gage records upstream and downstream of Surgoinsville. Addition of selected flood hydrographs on the North Fork Holston River and the South Fork Holston River (gage Nos. 03490000 and 03487500) showed peak flood discharges at their confluence, the head of the Holston River, to be essentially the same as peak discharges at Surgoinsville. Comparison of the Holston River peak flood discharges at Surgoinsville and downstream near Rogersville (gage No. 03491500), near Jefferson City (gage No. 03494000), and at Strawberry Plains (gage No. 03495500) before closure of Cherokee Dam showed essentially the same peak flood discharges at these locations. The essentially constant flood peaks along the Holston River occur because flood peaks are produced by the North and South Fork Holston watersheds and channel and floodplain storage along the Holston offsets the effect of runoff from the remainder of the Holston watershed.

Flood elevation frequency for the study reach downstream of mile 104 was determined by graphical frequency analysis of Cherokee Dam, mile 52.3, headwater elevations from 1953 through 1986 (References 4 and 5). Extrapolation of the frequency curve was guided by the headwater elevation from the TVA maximum probable flood, an extreme flood computed from transposed maximum observed storm rainfall. Analysis of stage records from 1970 to 1986 from the TVA stream gage at mile 104.0 (Reference 5) and step-backwater computations indicated that maximum flood elevations in this study reach are caused by maximum Cherokee Lake elevations rather than by high Holston River discharges which occur in conjunction with lower Cherokee Reservoir elevations.

The principal source of data for determining North Fork Holston River discharge frequency was records from USGS stream gaging station No. 0349000 at mile 8.8, about 3.8 miles upstream of the study reach. Discharge frequency for the study reach was determined from drainage area frequency-discharge relations based on this gage and data from other gages along North Fork Holston River (Nos. 03474000, 03474500, 03488000, 03488500, and 03487500). Flood-frequency curves were computed for these stations using procedures described in Bulletin No. 17A (Reference 14), including use of generalized skew from Plate I and adjustments for historic flood information where available. This work was done for previous Flood Insurance Studies for Kingsport and Sullivan County, Tennessee, prior to the publication of the currently applicable Bulletin No. 17B.

Regional relationships were developed to define peak discharge-frequency for Crockett Creek. The adopted relationships were determined from streamgage records on watersheds with hydrometeorologic characteristics similar to the study streams.

Flood-frequency curves for these streams were computed using the procedure in Bulletin No. 17B including the skew map of Plate 1 and adjustments for historic flood information where available (Reference 13). The results of these analyses were combined to develop the regional relationships applicable to rural watersheds in Hawkins County.

Peak discharge-frequency for Crockett Creek was determined using the adopted regional relationships with discharges increased to account for effects of urbanization in the watershed. Increased discharge resulting from urbanization was computed from the equation, $Q_{pu} = I^x Q_{pn}$, where:

Q_{pu} = Discharge for selected probability, p, for urban conditions, u

I = Percent imperviousness of watershed area

x = Exponents which vary with flood probability

Q_{pn} = Discharge for selected probability, p, for natural watershed, n

The equation and values of x and y were developed from equations by Espey and Winslow (Reference 15) which relate discharge at selected frequencies to watershed, channel, and climatic factors. The equation and x values were compared with and found to be consistent with studies by others. Urban areas were determined from topographic maps and aerial photographs. Percent imperviousness, I, was estimated using typical ratios of impervious area to urban area (Reference 15).

The analysis of available historic information for Crockett Creek indicates this information is compatible with the adopted peak discharge-frequency relationships.

Adopted Crockett Creek discharge-frequency estimates were compared with discharge-frequency estimates using relationships developed by the USGS for urban watersheds in Tennessee (Reference 16). Discharge-frequency estimates from these USGS relationships ranged from 35-percent to 6-percent less than the adopted discharge frequency estimates, and appeared to be too low compared to discharge frequencies for rural watersheds in the region. The differences between the adopted discharge-frequency estimates and those from USGS relationships result from different procedures used to develop each relationship. The adopted estimates were based on relationships determined from gaged watersheds in a region hydrometeorologically similar to Hawkins County with adjustment to account for the urbanization in the Crockett Creek watershed. The USGS relationships were based on synthetic discharge-frequency curves from rain-runoff modeling of urban watersheds throughout Tennessee.

Peak discharge-drainage area relationships for the 10-, 50-, 100-, and 500-year floods of each flooding source studied in detail in the community are shown in Table 1.

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (SQ MILES)	PEAK DISCHARGE (CFS) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
HOLSTON RIVER					
at confluence of Crockett Creek	3,073	46,000	68,000	79,000	109,000
just downstream of U.S. Government Railroad	2,779	46,000	68,000	79,000	109,000
NORTH FORK HOLSTON RIVER					
at mouth	729	27,000	40,000	46,000	63,000
at county boundary	716	26,800	39,500	43,500	62,000
CROCKETT CREEK					
at mouth	5.38	1,300	1,850	2,100	2,700
about 3,000 feet upstream of Arrowhead Drive	3.90	1,050	1,550	1,700	2,200
about 3,100 feet upstream of Cresswood Drive	2.74	850	1,200	1,350	1,750

Elevations for floods of the selected recurrence intervals of Cherokee Lake are shown in Table 2.

TABLE 2 - SUMMARY OF ELEVATIONS

FLOODING SOURCE AND LOCATION	PEAK ELEVATION (FEET NGVD)			
	10-YEAR	50-YEAR	100-YEAR	500-YEAR
CHEROKEE LAKE within community	1,073.5	1,074.8	1,075.0	1,075.0

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Cross sections were field surveyed. All bridges and culverts were surveyed to obtain elevation data, and structural geometry. On the North Fork Holston River valley cross sections were obtained by photogrammetric methods.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles and on the Flood Insurance Rate Map.

Water-surface elevations of floods of the selected recurrence intervals were computed using the HEC-2 step-backwater computer program (Reference 17).

Roughness coefficients (Manning's "n") used in the hydraulic computations were determined on the basis of field inspections of the channels and floodplain areas. Roughness values for the Holston River channel ranged from 0.03 to 0.048 and overbank values ranged from 0.08 to 0.15. For the North Fork Holston River channel values ranged from 0.03 to 0.072 and from 0.074 to 0.161 for overbank areas. Channel values for Crockett Creek ranged from 0.04 to 0.05 and overbank coefficients ranged from 0.09 to 0.15.

The downstream segments of small tributaries, near their confluences with large rivers or reservoirs, are generally subject to two types of flooding: flooding from the headwaters of the tributary itself and backwater flooding from the river or reservoir. The flood profiles for those tributary segments should therefore be based on the combined probabilities of both types of flooding. For the flood profiles for tributaries in this study, the probability of flooding above a certain elevation on the tributary was calculated as the sum of that probability

and the probability of the same elevation being exceeded on the river or reservoir, minus the product of those probabilities. This combined probability method is based on the assumption that the flood events on the tributary and the river or reservoir are independent but not mutually exclusive.

Independence is assumed because flooding on a large river or reservoir usually results from a storm that is centered outside the tributary drainage area and that generally does not produce significant flooding on the tributary. Similarly, flooding on the tributary usually results from a storm that is centered over the tributary drainage area and that does not generally produce significant flooding on the large river or reservoir. However, floods, not necessarily of the same frequency, can occur on both the tributary and the large river or reservoir as the result of the same storm; therefore, the flood events are not mutually exclusive.

The method described produces profiles that are higher than flat profiles representing backwater from the large river or reservoir and lower than those that would result from an analysis in which concurrent floods of equal frequency are assumed to occur on both sources of flooding.

Flood profiles were drawn showing the computed water-surface elevations for floods of the selected recurrence intervals. In cases where the 50- and 100-year flood elevations are close together, due to limitations of the profile scale, only the 100-year profile has been shown.

The hydraulic analyses for this study are based on the effects of unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study are shown on the map and described in the exhibit labeled Elevation Reference Marks.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages state and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100- and 500-year floodplain boundaries and 100-year floodway to assist communities in developing floodplain management measures.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the 100- and 500-year floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps enlarged to a scale of 1:4800 with a contour interval of 20 feet (Reference 18).

The 100-year and 500-year floodplain boundaries are shown on the Flood Insurance Rate Map. On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A, AE, AH, AO, A99, V, and VE), and the 500-year floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 100- and 500-year floodplain boundaries are close together, only the 100-year floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

For the streams studied by approximate methods, only the 100-year floodplain boundary was delineated using the Flood Hazard Boundary Maps for Hawkins County, Tennessee (Reference 1).

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces the flood-carrying capacity, increases the flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 100-year floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
HOLSTON RIVER								
A	0	650	11,883	6.6	1141.8	1141.8	1142.7	0.9
B	1390	770	13,707	5.8	1142.8	1142.8	1143.7	0.9
C	5650	1100	14,867	5.3	1144.6	1144.6	1145.3	0.7
D	10,025	980	13,998	5.6	1146.2	1146.2	1147.2	1.0
E	14,075	820	12,322	6.4	1148.1	1148.1	1149.1	1.0
F	19,375	450[2]	9407	8.4	1152.1	1152.1	1152.7	0.6
G	24,545	490	9933	8.0	1155.7	1155.7	1156.6	0.9
H	27,330	440	9858	8.0	1157.5	1157.5	1158.4	0.9
I	30,080	360	8744	9.0	1158.9	1158.9	1159.8	0.9
J	33,095	460	9435	8.4	1160.9	1160.9	1161.9	1.0
K	35,390	1000	20,390	3.9	1163.1	1163.1	1164.1	1.0
L	36,235	1400	16,129	4.9	1164.0	1164.0	1164.9	0.9
M	38,664	1450	15,945	5.0	1166.0	1166.0	1166.8	0.8
N	42,466	1550	15,279	5.2	1167.7	1167.7	1168.7	1.0
O	45,634	850	13,139	6.0	1168.8	1168.8	1169.8	1.0
P	48,432	470	9999	7.9	1170.0	1170.0	1170.9	0.9
Q	52,022	540[3]	9857	8.0	1172.0	1172.0	1172.7	0.7
R	53,184	540[3]	10,685	7.4	1173.5	1173.5	1174.2	0.7

[1]FEET ABOVE RIVER MILE 131.21
[2]WIDTH PERPENDICULAR TO FLOW
[3]THIS WIDTH EXTENDS BEYOND COUNTY BOUNDARY

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWKINS COUNTY, TN
(UNINCORPORATED AREAS)

FLOODWAY DATA

HOLSTON RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH[3] (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
NORTH FORK HOLSTON RIVER								
A	4490	245[2]	4113	11.2	1181.7	1181.7	1182.0	0.3
B	7010	230	4062	11.3	1185.3	1185.3	1185.5	0.2
C	9230	295	5819	7.9	1189.2	1189.2	1189.5	0.3
D	12,280	350	6048	7.5	1193.5	1193.5	1193.9	0.4
E	13,170	950	10,162	4.5	1194.6	1194.6	1195.5	0.9
F	14,880	250	5763	7.9	1195.7	1195.7	1196.6	0.9
G	18,770	210	4754	9.6	1199.1	1199.1	1199.7	0.6
H	21,970	210	5439	8.3	1201.8	1201.8	1202.4	0.6
I	22,370	240	6064	7.5	1201.9	1201.9	1202.9	1.0
J	25,795	420	8528	5.3	1203.8	1203.8	1204.8	1.0

[1]FEET ABOVE MOUTH
[2]WIDTH PERPENDICULAR TO FLOW
[3]THIS WIDTH EXTENDS BEYOND COUNTY BOUNDARY

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWKINS COUNTY, TN
(UNINCORPORATED AREAS)

FLOODWAY DATA

NORTH FORK HOLSTON RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
CROCKETT CREEK								
A	660	330	295	7.1	1075.0	1053.1[2]	1053.1	0.0
B	1200	290	363	5.7	1075.0	1056.6[2]	1056.6	0.0
C	2580	190	294	7.0	1075.0	1068.0[2]	1068.0	0.0
D	3630	60	316	6.4	1076.3	1076.3	1076.4	0.1
E	4950	60	547	3.7	1093.8	1093.8	1094.6	0.8
F	5720	70	259	7.5	1097.5	1097.5	1097.5	0.0
G	7280	70	536	3.5	1118.8	1118.8	1119.2	0.4
H	8000	50	215	8.5	1125.5	1125.5	1125.8	0.3
I	9330	70	354	5.0	1140.7	1140.7	1141.6	0.9
J	9510	25	138	12.6	1142.0	1142.0	1142.4	0.4
K	10,310	50	245	7.0	1155.0	1155.0	1156.0	1.0
L	11,380	100	443	3.7	1164.4	1164.4	1165.3	0.9
M	15,935	90	244	5.8	1210.9	1210.9	1211.7	0.8
N	17,015	70	313	4.3	1221.8	1221.8	1222.8	1.0

[1]FEET ABOVE CONFLUENCE WITH HOLSTON RIVER
[2]ELEVATIONS WITHOUT CONSIDERING EFFECTIVE JOINT PROBABILITY DETERMINATION

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWKINS COUNTY, TN
(UNINCORPORATED AREAS)

FLOODWAY DATA

CROCKETT CREEK

The floodways for this study were designed for optimum benefit to the community. Floodway analyses were based on equal conveyance reduction and adjusted as necessary to account for the effects of existing development and to provide functional and manageable floodways. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections and are shown in Table 3, Floodway Data. The computed floodways are shown on the Flood Insurance Rate Map. In cases where the floodway and 100-year floodplain boundaries are either close together or collinear, only the floodway boundary is shown. Portions of the floodway for the North Fork Holston River lie outside the county boundary.

Along streams where floodways have not been computed, the community must ensure that the cumulative effect of development in the floodplain will not cause more than 1.0-foot increase in the base flood elevations at any point within the community.

The area between the floodway and the 100-year floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood by more than 1.0 foot. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 2.

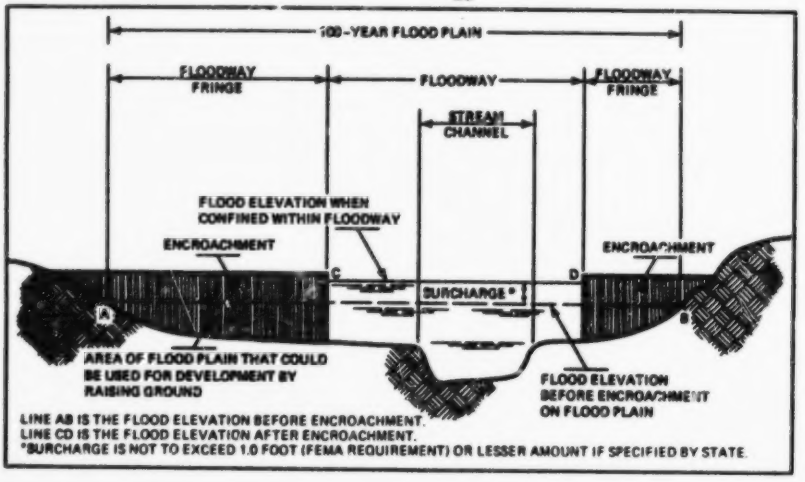
100-YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE *
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE AB IS THE FLOOD ELEVATION BEFORE ENCROACHMENT.
LINE CD IS THE FLOOD ELEVATION AFTER ENCROACHMENT.
*SURCHARGE IS NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE.

FIGURE 2 - Floodway Schematic

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 100-year floodplain, areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols the 100- and 500-year floodplains, the floodways, and the locations of selected cross sections used in the hydraulic analyses and floodway computations.

7.0 OTHER STUDIES

The Flood Insurance Studies published for Washington County, Tennessee and Scott County, Virginia (References 19 and 20) agree with this study.

The Flood Insurance Rate Maps printed for the Cities of Surgoinsville, Rogersville, Church Hill, and the Town of Bulls Gap, Tennessee (References 21, 22, 23, and 24) agree with this study.

The Flood Insurance Studies in progress for Grainger County and Greene County, Tennessee (References 25 and 26) agree with this study.

Revisions in progress to the published Flood Insurance Studies for Sullivan County and the City of Kingsport, Tennessee (References 27 and 28) agree with this study.

This Flood Insurance Study supersedes the previously printed Flood Hazard Boundary Map for Hawkins County, Tennessee (Reference 1).

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, FEMA, 1371 Peachtree Street, NE., Suite 736, Atlanta, Georgia 30309.

Future revisions may be made that do not result in the republishing of the Flood Insurance Study report. To ensure that any user is aware of all revisions, it is advisable to contact the map repository of flood hazard data located in the community.

9.0 REFERENCES AND BIBLIOGRAPHY

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4. Tennessee Valley Authority, Operation of TVA Reservoirs, Division of Air and Water Resources, Knoxville, Tennessee, 1947-1982.

5. Unpublished data from Tennessee Valley Authority files.

6. U.S. Geological Survey, Water Resources Data for Tennessee, Annual Report, 1961-1986.

7. ----------, Magnitude and Frequency of Floods in the United States, Part 3-B. Cumberland and Tennessee River Basins, Water Supply Paper 1676, Washington, D.C., 1964.

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19. Federal Emergency Management Agency, Flood Insurance Study, Washington County, Unincorporated Areas, Tennessee, September 1982.

20. ----------, Flood Insurance Study, Scott County, Unincorporated Areas, Virginia, November 1979.

21. ----------, Flood Insurance Rate Map, City of Surgoinsville, Hawkins County, Tennessee, July 1986.

22. ----------, Flood Insurance Rate Map, City of Rogersville, Hawkins County, Tennessee, June 1986.

23. ----------, Flood Insurance Rate Map, City of Church Hill, Hawkins County, Tennessee, February 1987.

24. ----------, Flood Insurance Rate Map, Town of Bulls Gap, Hawkins County, Tennessee, July 1986.

25. ----------, Flood Insurance Study, Grainger County, Unincorporated Areas, Tennessee, in progress.

26. ----------, Flood Insurance Study, Greene County, Unincorporated Areas, Tennessee, in progress.

27. ----------, Flood Insurance Study, Sullivan County, Unincorporated Areas, Tennessee, September 1982, revision in progress.

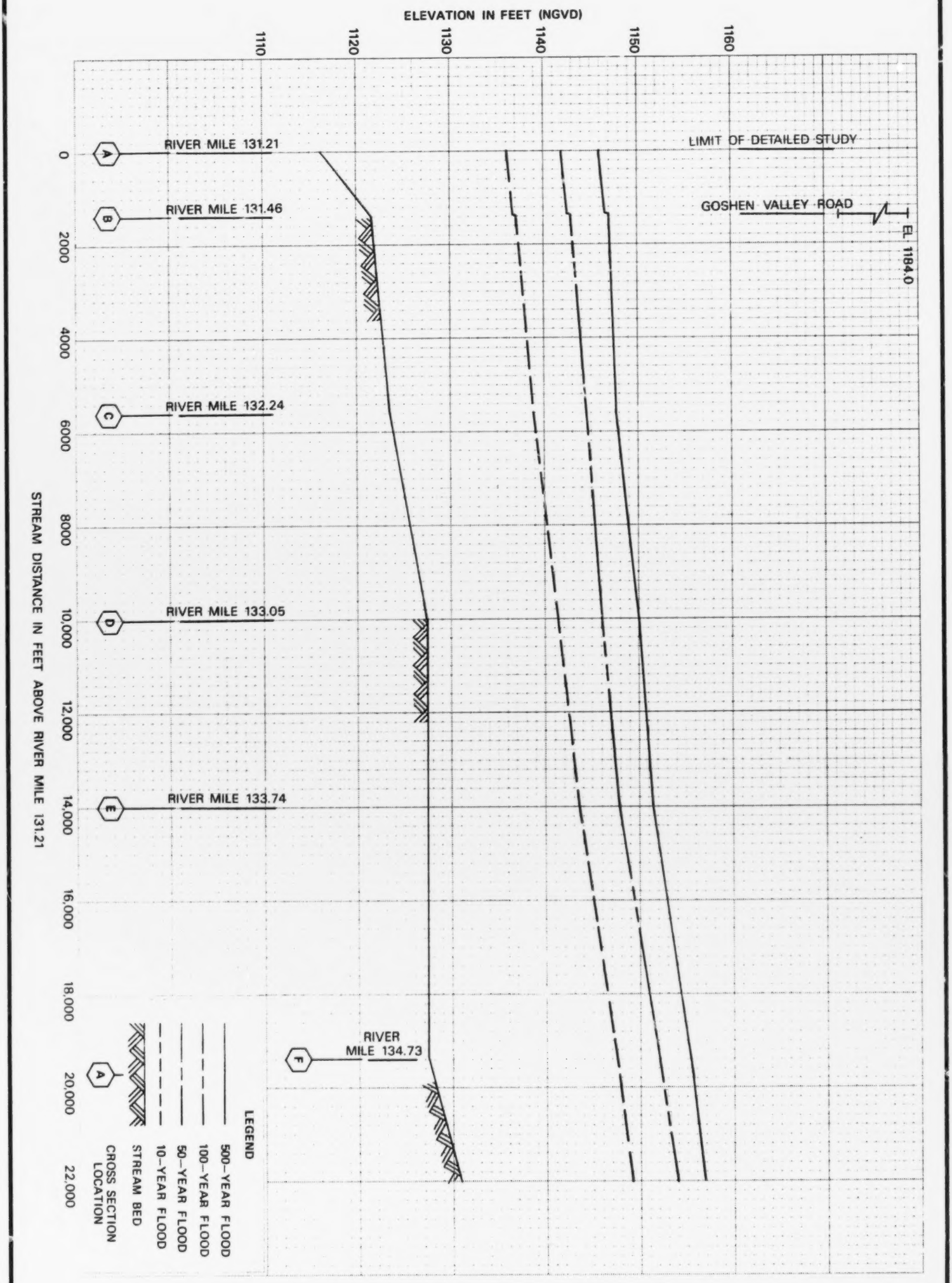
28. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, City of Kingsport, Hawkins and Sullivan Counties, Tennessee, December 1979, revision in progress.

ELEVATION REFERENCE MARKS

REFERENCE MARK	FLOOD INSURANCE RATE MAP PANEL	ELEVATION (FEET NGVD)	DESCRIPTION OF LOCATION
1	0060	1,249.85	chiseled square on north end of concrete headwall located east of track of CSX railroad 300 feet north of centerline of the North Fork Holston River
2	0060	1,254.15	standard disk stamped "B 58 1934" set in top of concrete post located about 0.28 mile north of centerline of the North Fork Holston River, about 48 feet east of CSX railroad, 12 feet north of private gate and road grade crossing
3	0065	1,121.36	staff board and plates at stream gage located on right bank at the Holston River, 1,200 feet downstream from Goshen Valley Road bridge
4	0065	1,187.65	chiseled square on right bank downstream wingwall of Goshen Valley Road bridge over the Holston River
5	0065	1,138.55	staff board and plates at right water's edge, about 3,900 feet upstream of confluence of Smith Creek, Holston Army, 900 feet downstream from ammunition plant boundary signs on right bank of the Holston River, attached to leaning box elder, behind VFW building, 300 feet downstream from boat ramp
6	0070	1,179.33	chiseled square on upstream left abutment of Army Road bridge over the Holston River
7	0115	1,116.10	chiseled square on upstream right end of Arrowhead Drive bridge over Crockett Creek

ELEVATION REFERENCE MARKS (Continued)

REFERENCE MARK	FLOOD INSURANCE RATE MAP PANEL	ELEVATION (FEET NGVD)	DESCRIPTION OF LOCATION
8	0115	1,061.98	upstream creekside corner of concrete manhole located about 300 feet north of mouth of Crockett Creek
9	0115	1,087.01	60d nail in downstream side of power pole No. 9, located 10 feet from water's edge on right bank of Crockett Creek, 50 feet downstream of Caldwell Road bridge over Crockett Creek



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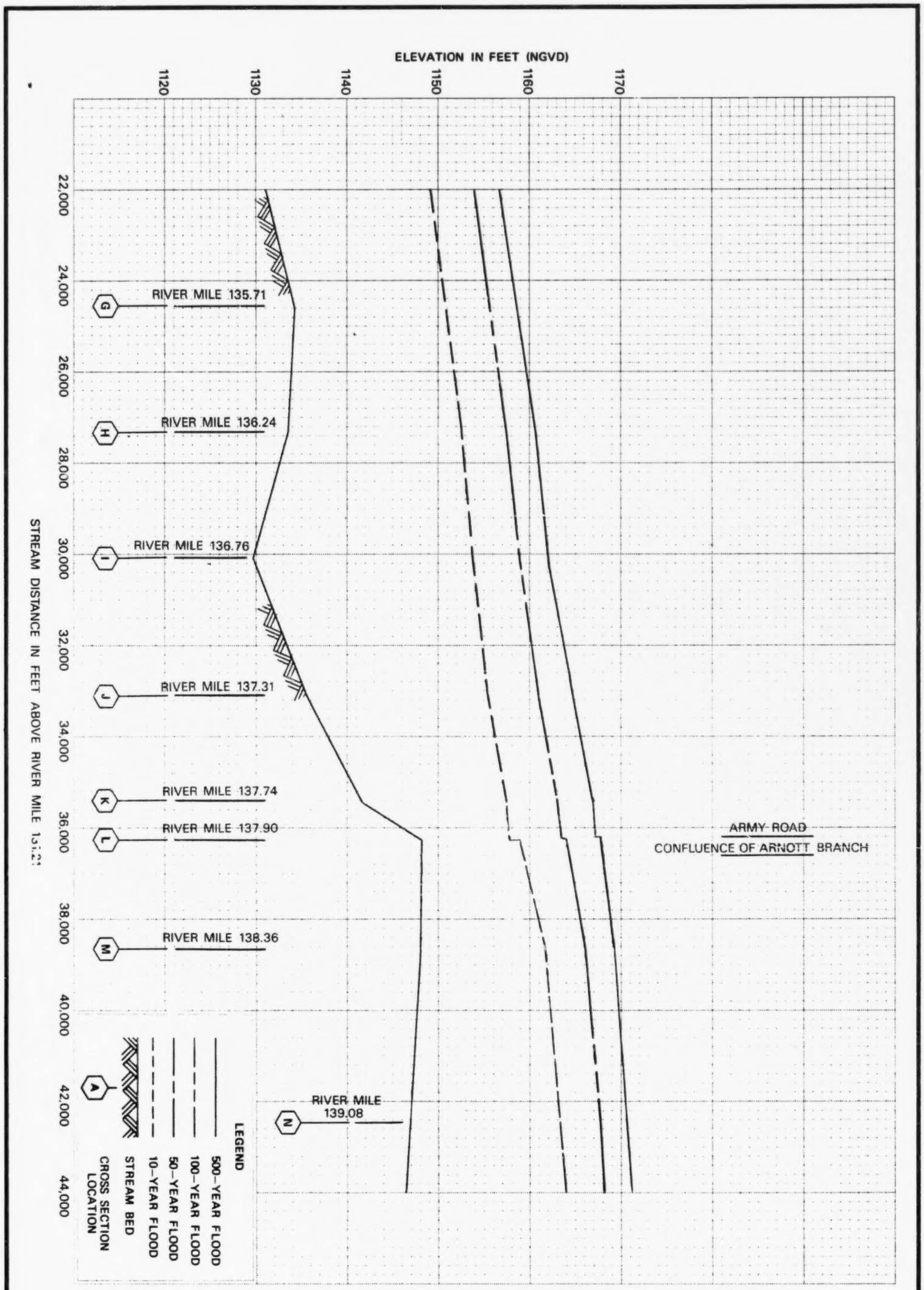

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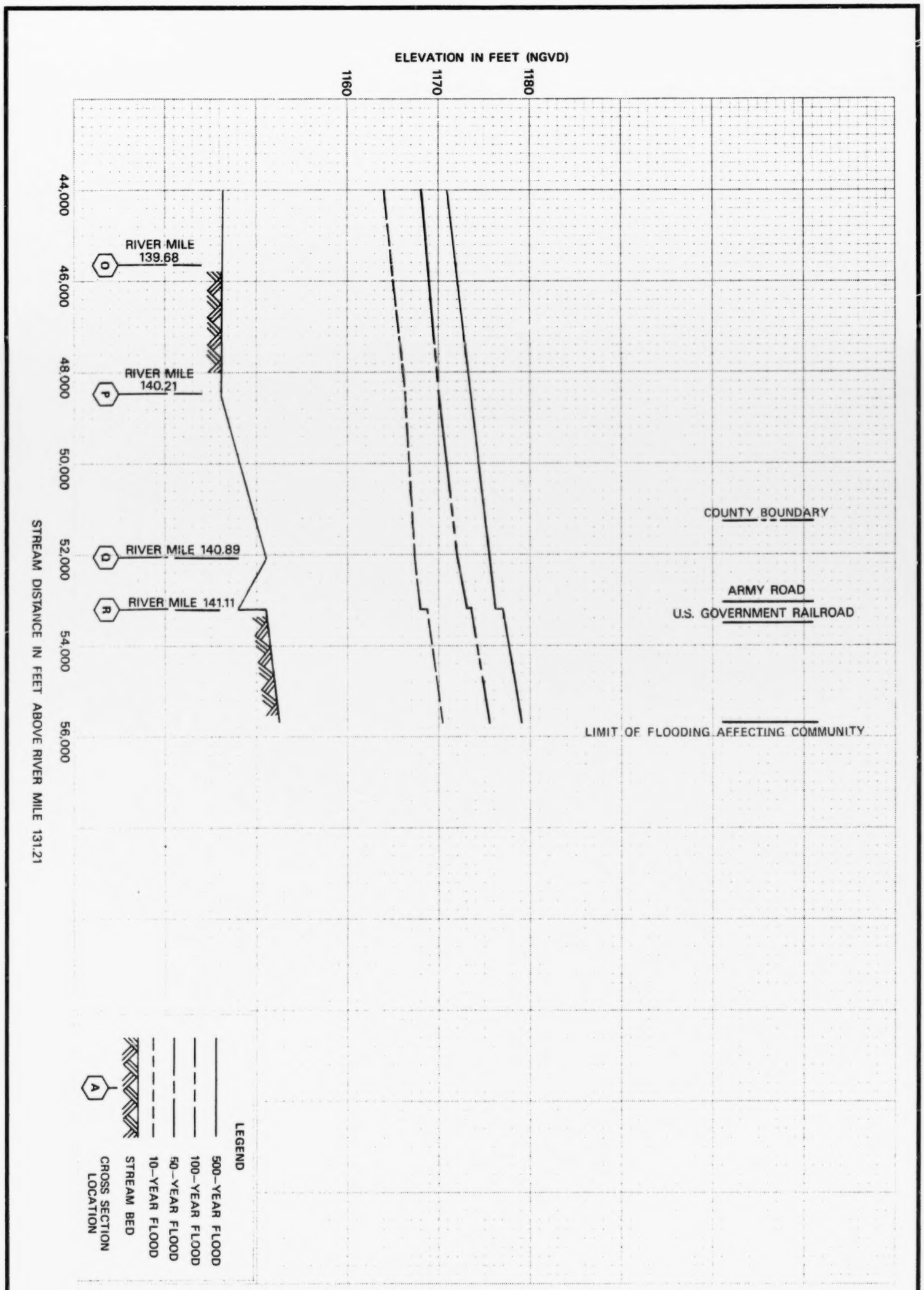
02P

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWKINS COUNTY, TN
(UNINCORPORATED AREAS)

FLOOD PROFILES

HOLSTON RIVER



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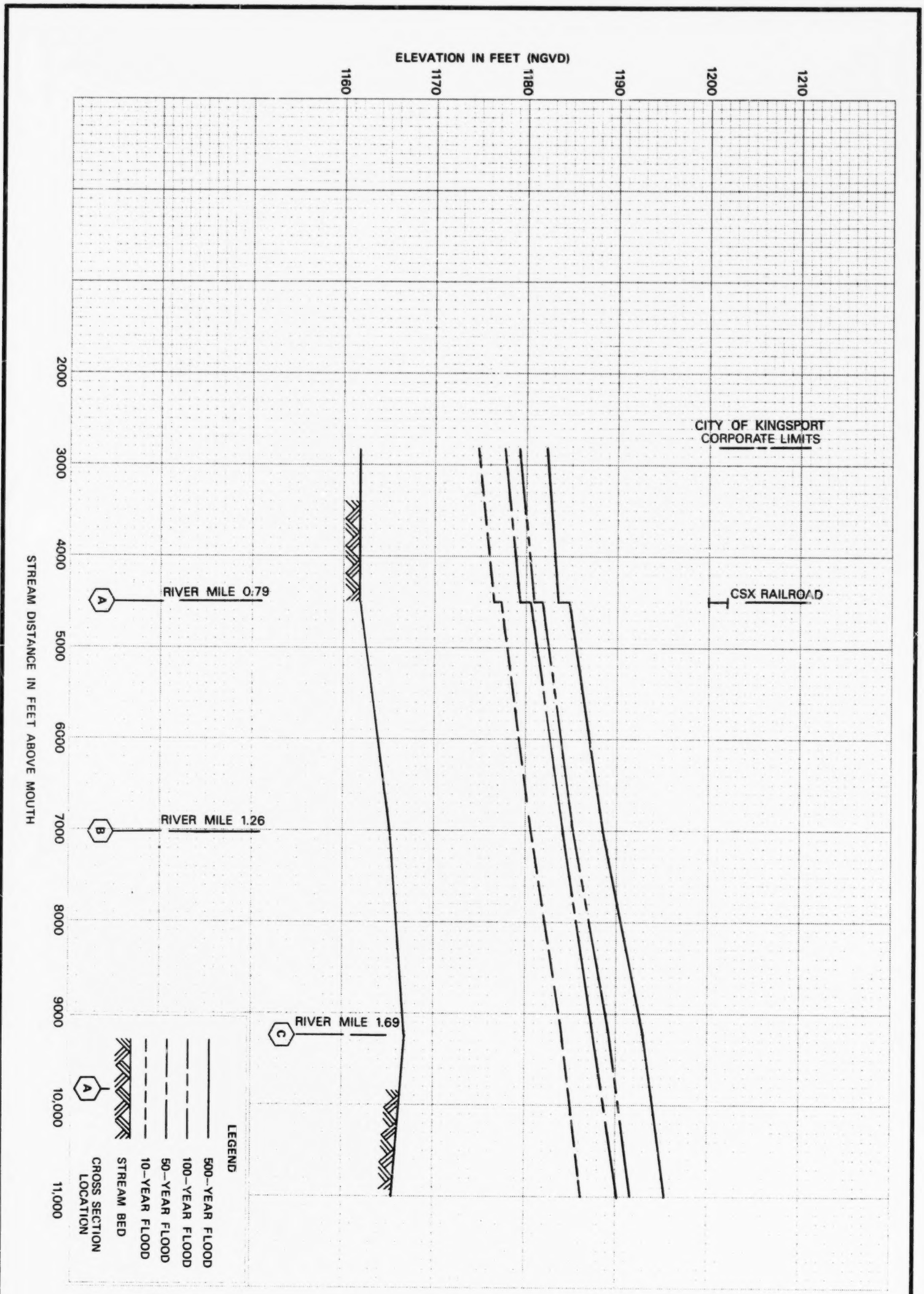

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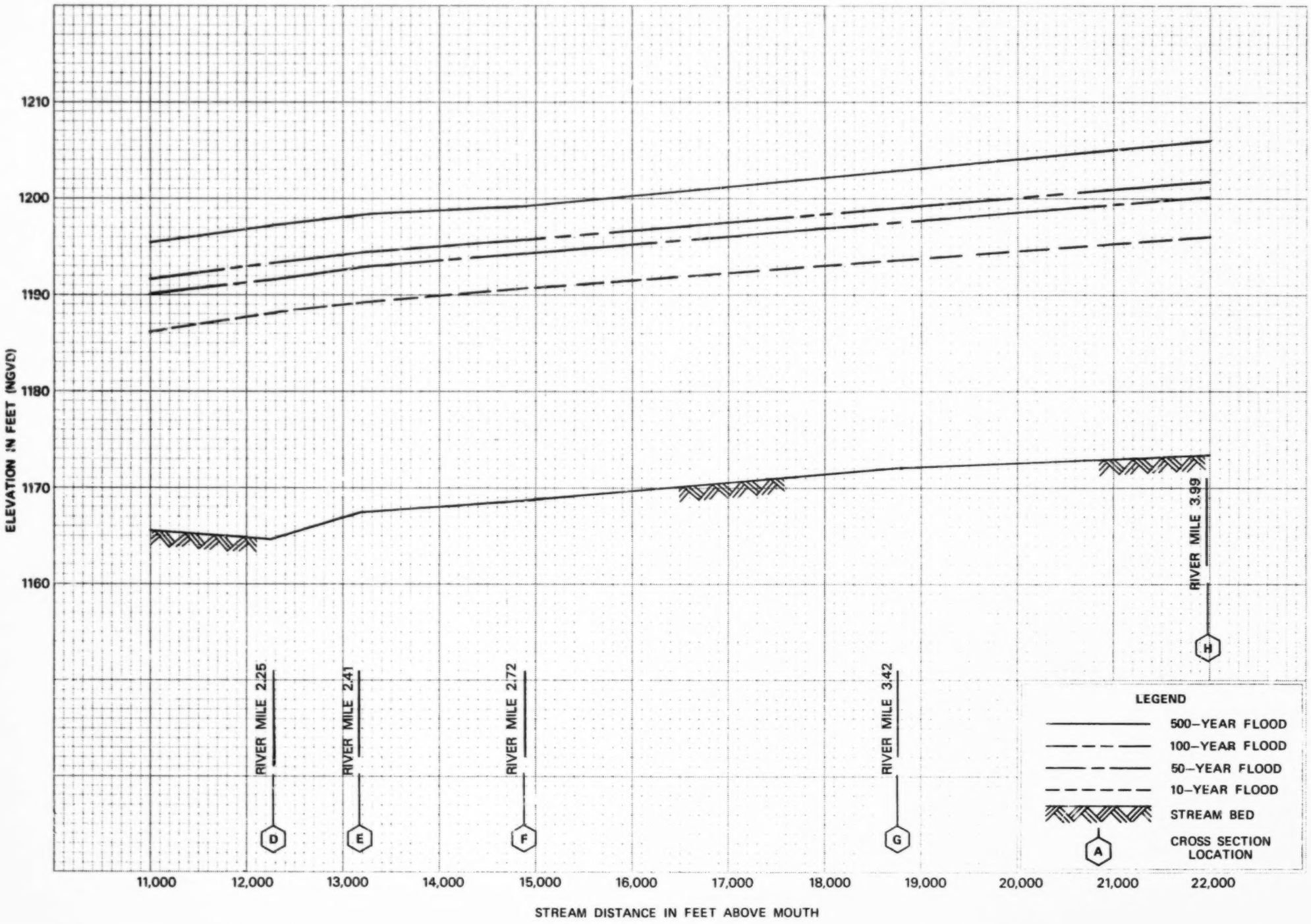


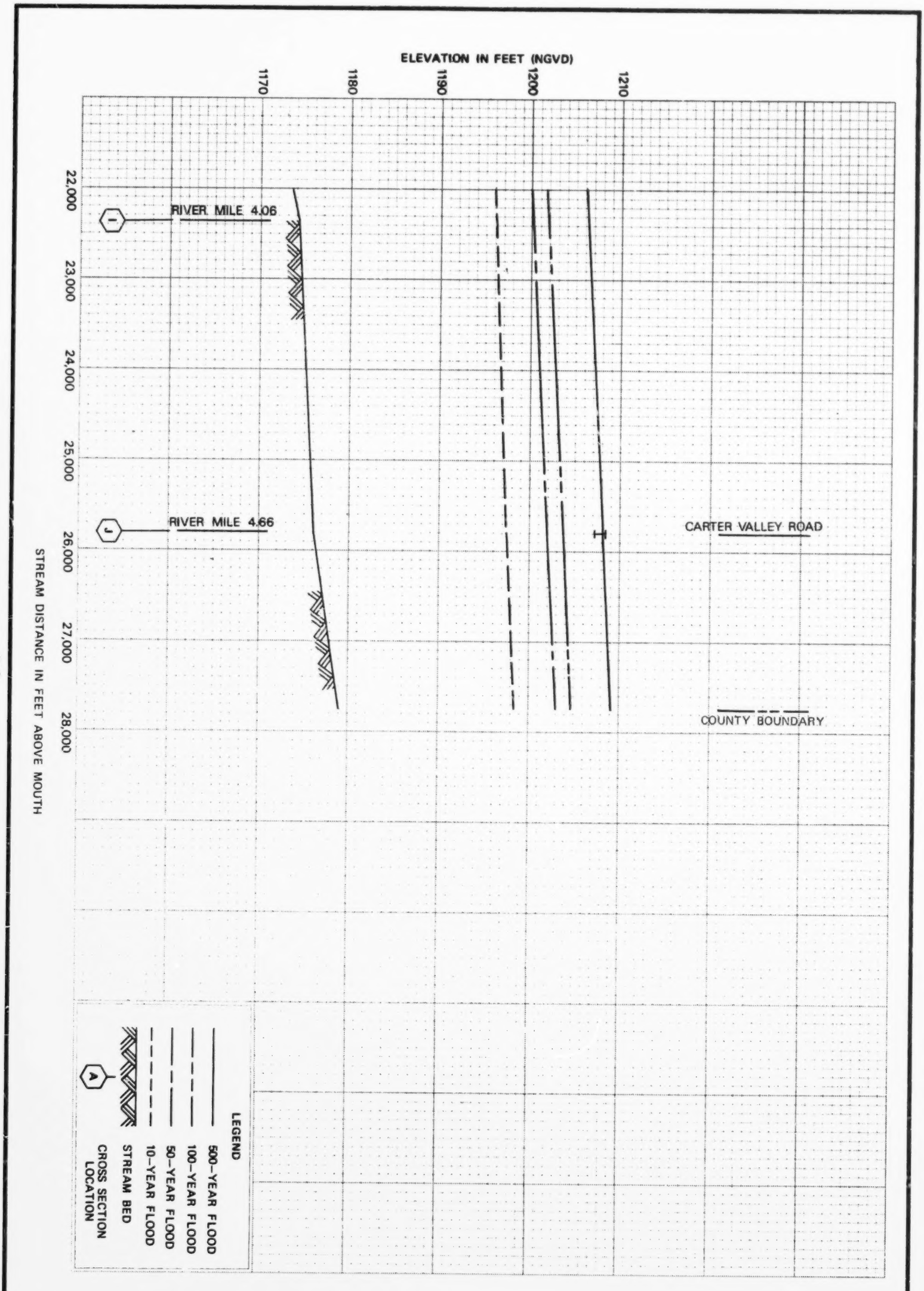
FLOOD PROFILES

NORTH FORK HOLSTON RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWKINS COUNTY, TN
(UNINCORPORATED AREAS)

05P



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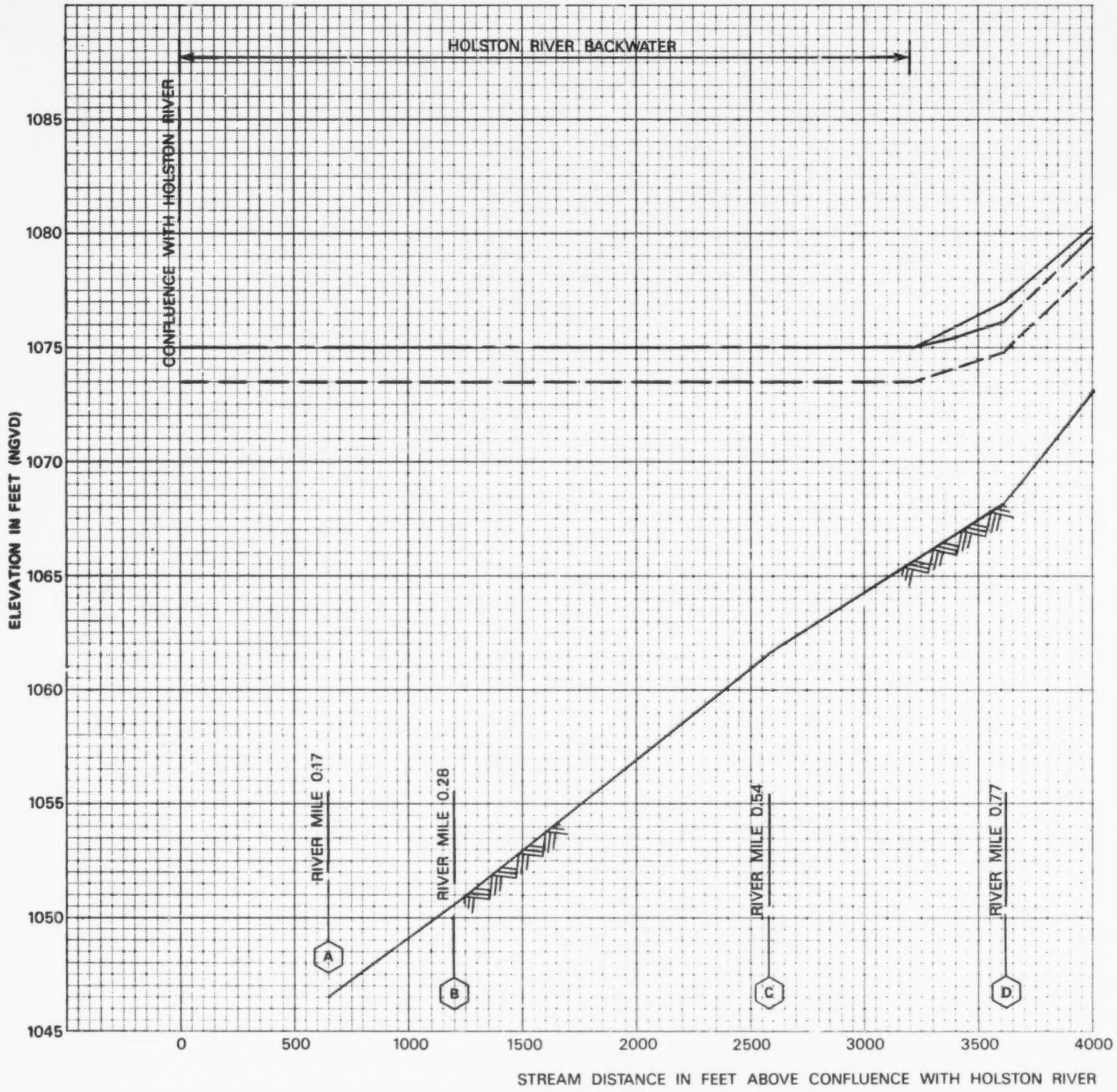

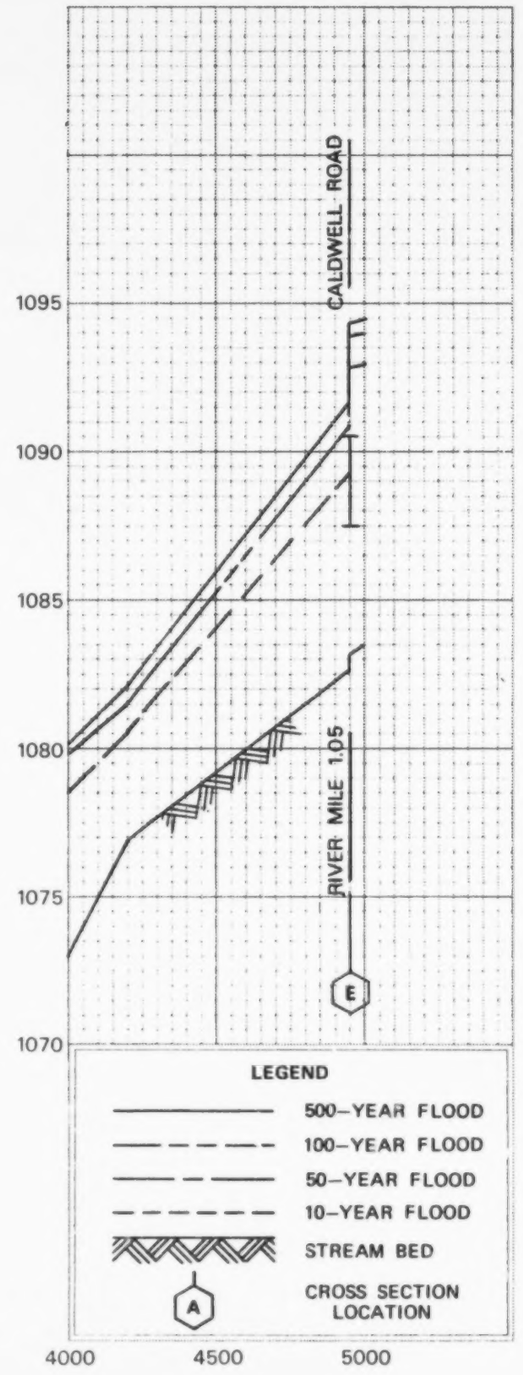

FLOOD PROFILES

CROCKETT CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWKINS COUNTY, TN

(UNINCORPORATED AREAS)

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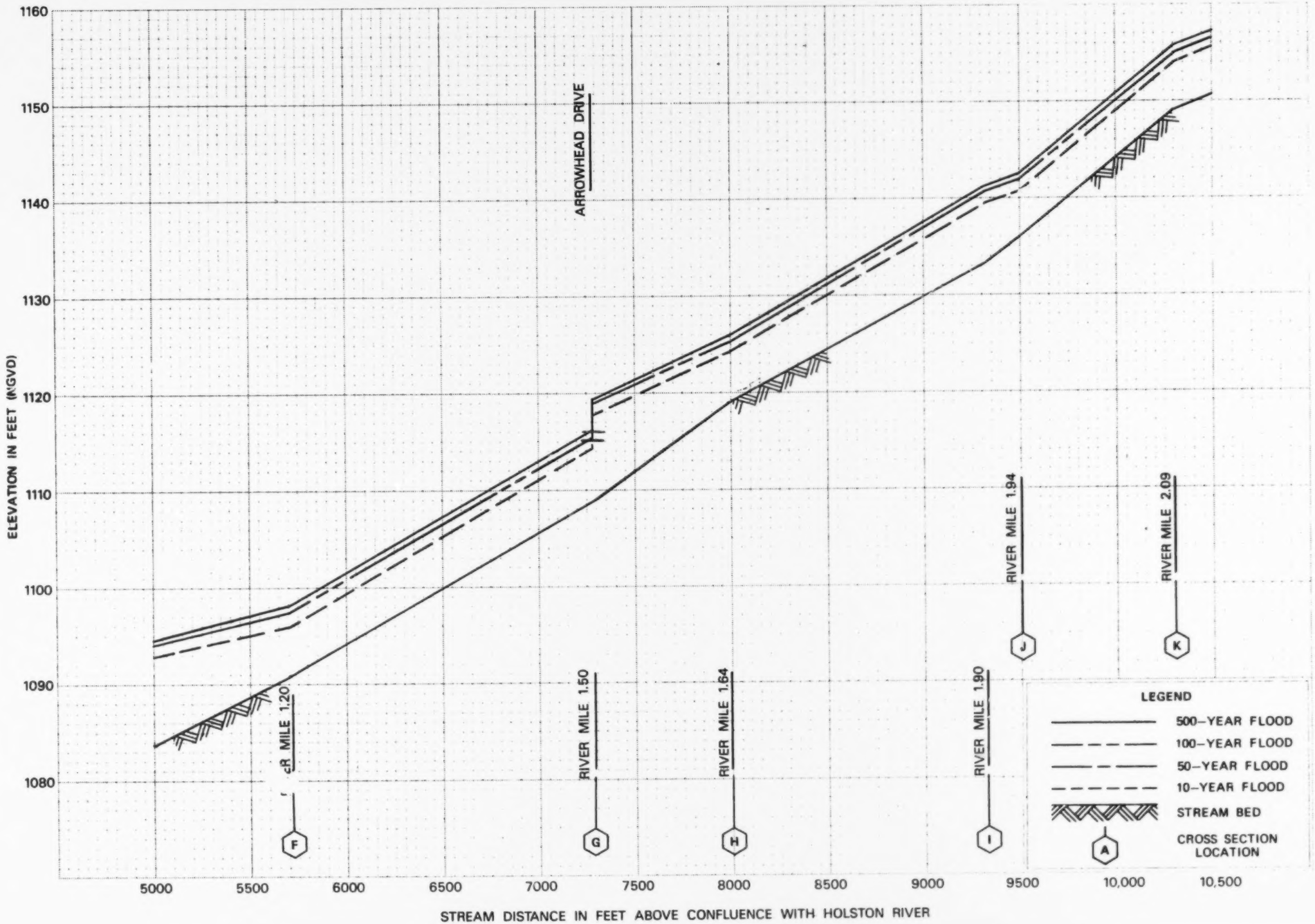

FLOOD PROFILES

CROCKETT CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWKINS COUNTY, TN
(UNINCORPORATED AREAS)

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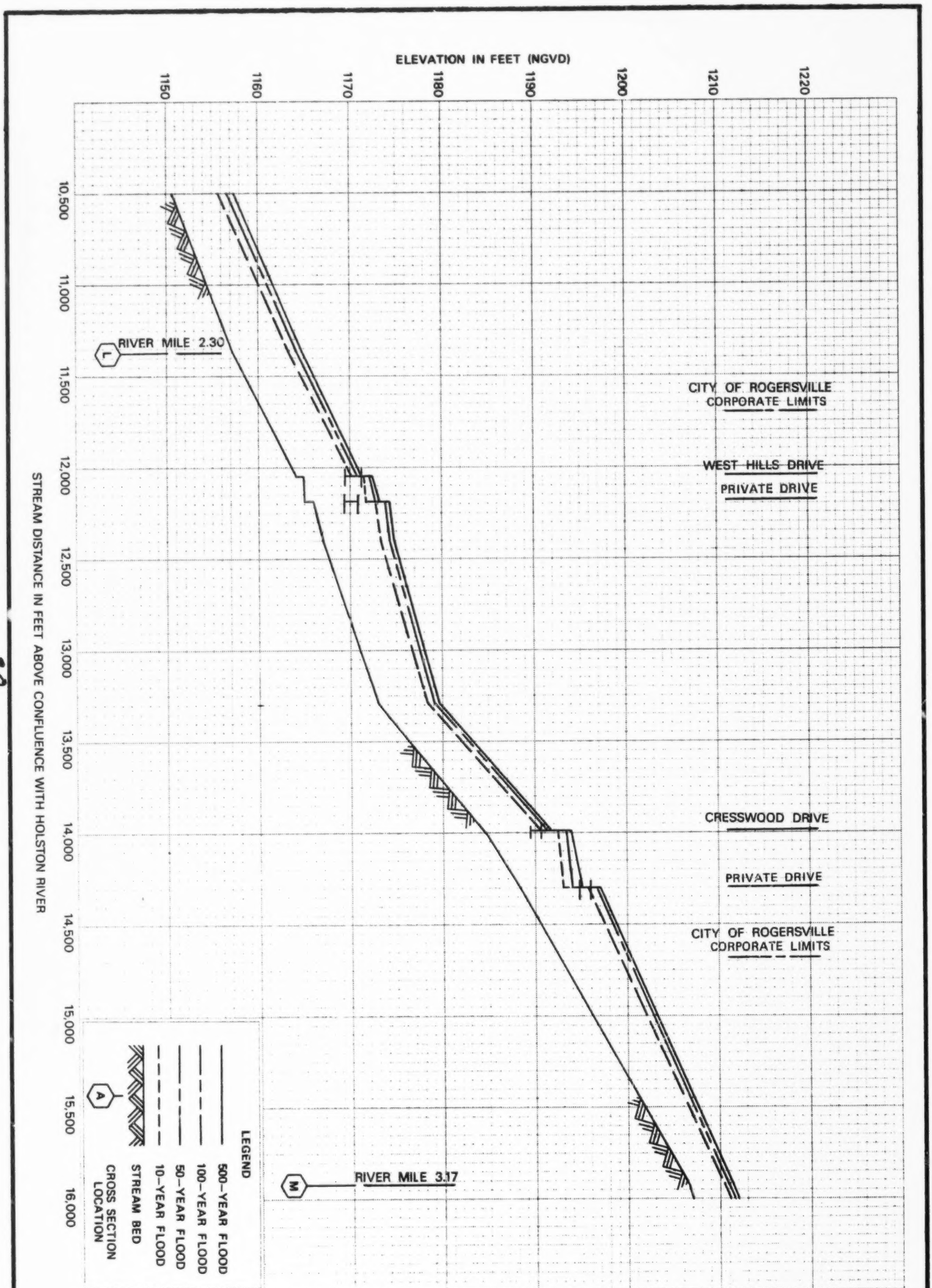

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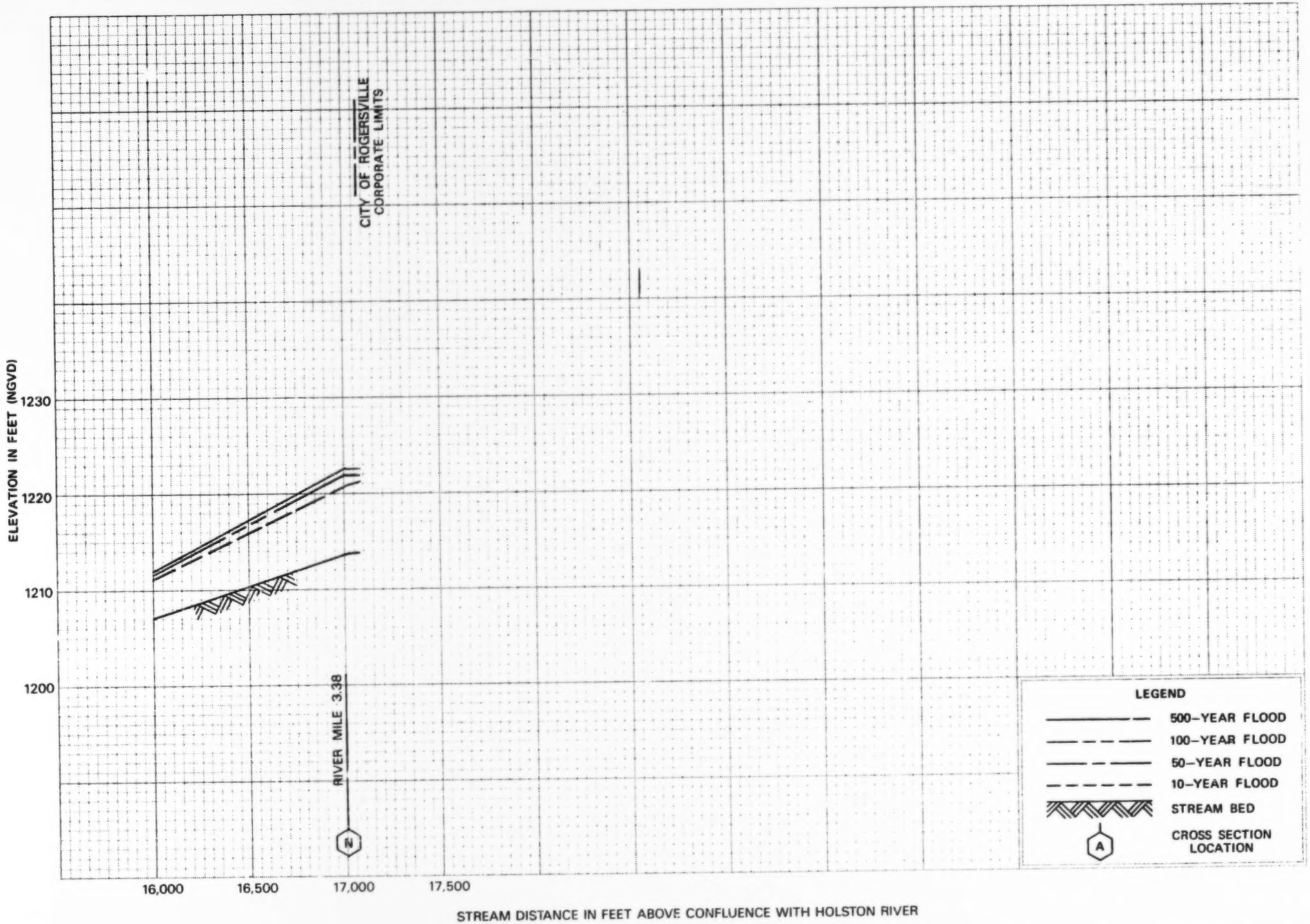

FLOOD PROFILES

CROCKETT CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

HAWKINS COUNTY, TN
(UNINCORPORATED AREAS)

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